BOLETUS LONGIPES MASS., A CRITICAL MALAYSIAN SPECIES

by

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SUMMARY

Boletus tristis Pat. et Baker is a synonym of *B. longipes* Mass. and is based on young specimens. The taxonomic position of *B. longipes* is problematic but it is retained in *Boletus* subgen. *Tylopilus* Karst. *Austroboletus* (Corner) Wolfe is not considered a satisfactory genus.

This species, described from specimens collected in the Gardens' Jungle in Singapore, is common in the Malay Peninsula and is evidently abundant in Sarawak (Corner 1972a, 1974). Its small and inconspicuous fruit-bodies, with smoky umber pileus, develop at the beginning of every agaric season. It is difficult to classify, however, because it does not fit well into any genus or subgenus. Notably the fresh spore-print is deep blood-red; with a touch of dilute potash it blackens. This colour, which is unusual in agarics, is the more remarkable because the tubes and pores, at first pallid white, become pale olivaceous and suggest that the spores should be olivaceous; eventually the pileus and stem become roseate from the spore-deposit. I put the species in *Boletus* subgen. *Tylopilus* Karst. with pink spores because the red colour seemed but an intensification. Moreover, there are two other Malaysian species of similar appearance, namely *B. atripurpureus* Corner and *B. griseipurpureus* Corner, the spore-prints of which are pinkish ochraceous and reddish pink respectively, though they do not darken with potash. The problem has recently been intensified through the work of Wolfe (1979) who finds an ultramicroscopic roughness on the spores of *B. longipes*, for which reason he transfers it to the new genus *Austroboletus* (Corner) Wolfe, which I had described as a subgenus of *Boletus*. He also treats *B. tristis* Pat. et Baker as a different species from *B. longipes*, of which I had regarded it as a synonym. Both decisions are questionable, and I take the second first.

B. TRISTIS AND *B. LONGIPES*

According to Wolfe (1979, p. 78, for there is no index to this work) *B. tristis* is to be distinguished by:—

1. relatively narrower spores with the mean (? average) value of E greater than 3.0, where E is the ratio of length to width, as a measure of ellipticity (Corner 1947): in *B. longipes*, E is less than 3.0.

2. subhymenium not wider than the hymenium; in *B. longipes* 1.5–2.0 times as wide.

Regarding the spores, I had commented on their variability in *B. longipes* and had made var. *latisporus* for collections with wide spores (Corner 1972a, 1974), but this is omitted by Wolfe. The reliable spore-measurements for the two species are given in Table 1.

TABLE 1. SPORE-SIZE IN *B. LONGIPES* AND *B. TRISTIS*

Species	Spore-size (μm)	E (mean)	Authority
B. longipes			
v. *ablus*	12–15 x 4.2–4.5	3.1	Corner (1974)
v. *longipes*	11.5–17.5 (–19) x 4.3–5.5	3.0 (–3.1)	Corner (1972a)
v. *longipes*	11.5–16 x 4.5–5.3	2.8	Corner (1974, P-143B)
v. *longipes*	12–14 x 4.5–5.7	2.6	Corner (1974, P-143A, C)
v. *latisporus*	13–16 (–17) x 5–6.5	2.5	Corner (1972a)
v. *longipes*	10–13 x 4.5–5.2	2.4	Corner (1974, P-143)
v. *longipes*	15.5–19.5 x 5–6.5 (–8)	2.0–3.5	Wolfe 1979, type)
v. *longipes*	10.3–11.7 x 4.3–4.5	2.5	Wolfe, Petersen (1978, type)
B. tristis	12–14 x 4	3.3	Patouillard, Baker (1918)
B. tristis	14–17 (–19) x 4–5.5	3.3 (–3.5)	Singer (1945, type)
B. tristis	12.5–15.5 x 4–4.5	2.7–3.9	Wolfe (1979, type)
B. tristis	8.7 x 4.5	1.9	Wolfe, Petersen (1978, type)

I conclude as follows:—

1. Since there are no other differences in the numerous collections of *B. longipes* which I studied except for the lack of colour in the fruit-body of var. *albus*, the spores of *B. longipes* are very variable. The spore-width is related to the narrow limits of the basidium-width (10–12 μm for living basidia, Corner 1972a). The variation in length is connected with the amount of cytoplasm available which will depend, if initial vacuolaton is constant, on the length of the basidium which varies 25–45 μm in living basidia. It is possible that the longer basidia, giving longer spores, may be the primary basidia of young fruit-bodies or of young parts of the tubes, whereas the short basidia, giving short spores, may be the subsequent intercalations. Thus young fruit-bodies may give relatively narrower spores than the mature. The small size of the basidia given by Wolfe (26–31 x 6.5–9 μm, p. 103) must refer to immature or collapsed basidia.

2. The spores of *B. longipes* seem absolutely wider (4.3–6.5 μm) than those of *B. tristis* (4–5.5 μm), but the difference is slight and may be connected with the age of the fruit-bodies, those of *B. tristis* being young. The size of the fruit-bodies and their colour, as given by Patouillard and Baker (1918), suggest that they were young. This is confirmed by Wolfe's description of the pile of hyphal ends on the pileus as not yet disrupted by expansion.

3. Different authors, having examined the type of *B. tristis*, give different spore-measurements. Those cited for Wolfe and Petersen (1978) were taken from their figures and the magnification given for them. Their spores are unaccountably short, though seemingly of mature width; there is the same discrepancy in their Fig. 5 for *B. dictyotus*. Wolfe does not explain this and he omits Singer's measurements.

4. The variations in the value of E are not sharply delimited.

5. Possibly *B. tristis* is a variety of *B. longipes* with absolutely narrower spores. For proof, this will require the study of more collections and a study of spore-variation in fruit-bodies of different ages.

With respect to the relative width of hymenium and subhymenium, it is necessary to be clear what these terms refer to. If the hymenium is the layer of basidia to the exclusion of the pleurocystidia, which project further, then its thickness cannot be measured exactly because some basidia project more than others and some arise more deeply in the tissue; neither external nor internal boundary is precise. For subhymenium I have always taken the layer of interweaving or interlocking hyphae from which the basidia arise. Others, however, may consider that the subhymenium includes the layer of hyphae divergent from the longitudinal hyphae (medulla) in the middle of the trama; that is, the cortex of the multifilamentous soma is to be included. Wolfe is not explicit, but it seems that he must intend the second meaning. Both features, however, change in the life of the fruit-body, and thicken. The subhymenium, as the layer of interwoven hyphae, thickens as these hyphae branch and introduce more basidia, and this lateral extension of the hymenium stretches the divergent hyphae (of the cortex) so that they diverge more widely from the medulla and from each other. Both layers are thicker in old fruit-bodies and in the upper parts of the tubes. For *B. tristis*, Wolfe (p. 126) gives the trama as 'slightly boletoid', which implies that it is immature with, as yet, slightly divergent cortical hyphae. The detail confirms the suspicion that the type-collection of *B. tristis* consists of young fruit-bodies. Presumably, if they had grown larger, the trama would have become as boletoid as in *B. longipes*. Thus I see no specific criterion in this distinction. For *B. longipes* I find that the subhymenium of interwoven hyphae thickens gradually from some 10–12 μm in young specimens and from near the pore-mouths to 20–25 (–30) μm in the upper parts of the tubes of old specimens; the hymenium is about 30–40 μm thick.

Lastly in this matter of specific distinction, there is the obvious question why Patouillard and Baker did not find the common *B. longipes* in the small area of the Gardens' Jungle where they collected their material, where H.N. Ridley had collected and first found *B. longipes*, and where I found it repeatedly from 1929 to 1944. Of the sixteen species of boleti which they described as new from the Gardens' Jungle, eleven had already been described by Massee. As he had described the pileus of *B. longipes* erroneously as viscid, doubtless this misled Patouillard and Baker.

AUSTROBOLETUS (CORNER) WOLFE

On making *Boletus* subgen. *Austroboletus*, I was cautious because, as I explained at some length, there seemed to be connections with subgen. *Tylopilus*, especially with species of *Porphyrellus* Gilbert which, with other mycologists, I regarded as part of *Tylopilus*. My point was that the species placed in *Austroboletus* were a distinct and natural alliance within the wide concept of *Boletus*. In raising the subgenus to a genus, Wolfe (p. 64) had remarked earlier (p. 62) that 'I believed that it had little in common with *Porphyrellus* sect. *Porphyrellus*', which is practically the opposite of my published conclusion. On p. 14, Wolfe gives a generic description of *Tylopilus* under which he includes *Porphyrellus*; on p. 66 he gives a generic description of *Austroboletus*. Both descriptions are variously inaccurate by omission and misrepresentation, but it is not clear whether the descriptions refer only to North American species or include those of the world; in any case a genus should not vary geographically. It seems that not until p. 130, in the summary, that *Tylopilus* and *Austroboletus* are actually compared. Here *Austroboletus* is distinguished by its ornamented spores, short and narrow pleurocystidia 'devoid of any microchemically positive contents', and subclavate cheilocystidia 'as fingers hanging from the tube-edge'. The marginal veil (mistakenly desecribed by Wolfe on p. 66 as unrolling), the colour of the spore-print, and the characteristically strong gelatinisation of the tubes in alcohol-formalin (as a physicochemical test) were omitted by him.

Regarding the pleurocystidia, I find no sharp distinction for I have measurements up to 90 μm long and 18 μm wide for the species which I placed in *Austroboletus*, and Wolfe gives measures of 40–105 (–120) x 9–20 (–27.5) μm for *Tylopilus* subgen. *Porphyrellus*. I gave shorter values for several species of *Tylopilus* in Malaya (Corner 1972a) and from some the pleurocystidia were absent. As for the cheilocystidia, I never observed in *Austroboletus* such 'fingers'. His distinction between the two genera must rest, therefore, solely on the spores.

There enters now a practical problem that will become more acute as the spores of more species are examined with the electron-microscope. It reveals that spores that appear smooth under the light-microscope may be very minutely rough, verrucose, or reticulately marked. Why, then, does a spore become smooth or rough ? I considered the question in my article on the Boletus-spore (Corner 1972b), which was written several years before the book on the Malayan species of *Boletus,* but long delayed in publication; hence there are some uncertainties about the names that were used. I pointed out that some species have extremely fine markings on the spore, barely visible under the light-microscope, and drew attention to the smooth spores of *B. nanus* Mass., *B. ablo-ater* Schw., and *Boletus* 18b of my notes (which is *B. griseipurpureus*), all of which belong to subgen. *Tylopilus,* and to those of *B. phaeocephalus* Pat. et Baker in subgen. *Boletus.* These spores are endospores, still very finely marked, from which the exospore has dissolved. Similarly I drew attention to the very finely striate spores of *B. fallax* Corner, *B. obscurecoccineus* Hoehn., and *B. ridiculus* Corner in subgen. *Boletellus.* I concluded in that paper that the smooth, narrow, typically boletoid spore was an endospore caused by compression of the spore in its development. The markings on the spores of *Austroboletus, Boletellus, Heimiella* and *Strobilomyces* lie internal to the smooth exospore and may be deposits from the mesospore or the endospore. Thus, boletoid spores which appear smooth may have vestigial markings in all degrees from that barely visible under the light-microscope to that barely visible under the electron-microscope. The problem may well come to decide at what magnification a spore is to be considered smooth.

B. longipes is a case in point. Under the electron-microscope its endospore is minutely and irregularly creviced (Wolfe and Petersen 1978). Their Fig. 1, for *B. tristis,* shows these crevices more as pits in a close and minute reticulum. If one was looking for an intermediate between the coarsely marked spore typical of *Austroboletus* and the smooth spore of *Tylopilus,* then *B. longipes* is an instance. It confirms my suspicion that *Austroboletus* cannot be separated generically. However, there are other features of *B. longipes* to be considered which lead me to doubt Wolfe's remark (p. 105) that *B. longipes* 'clearly belongs in *Austroboletus*'; he has not amended the description of this taxon to include *B. longipes.* My reasons are as follows: —

1. The colour of the spore-print, blackening in potash, is not that of *Austroboletus.*

2. The spore-shape is not amygdaliform as in *Austroboletus,* but typically boletoid as in *Tylopilus.* This is shown by the mean value of E (spore-length to spore-width); in *Austroboletus* it is 1.9–2.3, in *B. longipes* 2.4–3.3, and in *Tylopilus* 2.2–4.0. The compression of the boletoid spore is shown by the relation of the spore-width to the basidium-width; in *Austroboletus,* with least compression, it is 0.50–0.60, in *B. longipes* 0.45, and in *Tylopilus* 0.35–0.50 (Corner 1972b).

3. The pleurocystidia are not short and narrow, and they have vitreous-oily contents which often turn red-brown in alcohol-formalin (as a microchemical reduction), as in *Tylopilus.*

4. The cheilocystidia are large and clavate as in *Tylopilus.*

5. The tubes are adnato-decurrent to sinuato-adnexed as in *Tylopilus.*

6. The tube-trama is firmly subgelatinous in alcohol-formalin as in *Tylopilus,* not sloppily gelatinous as in *Austroboletus.*

7. The stem is not lacunoso-reticulate as common in *Austroboletus,* but longitudinally rugulose with shallow elongate meshes as in *Tylopilus.*

8. The pileus lacks the marginal veil, as in *Tylopilus.*

I conclude that *B. longipes* fits for all practical purposes with *Tylopilus* and that it does not have the distinctive features of *Austroboletus.* Nevertheless, its spores are peculiar and it is to be hoped that allies of it will be discovered in the forests of south-east Asia. I note that the SEM fiugre of the spore of *B. longipes,* shown by Wolfe and Petersen, reveals a slight smooth adaxial patch such as occurs more noticeably in *Austroboletus* and *Strobilomyces;* and this may indicate another line of boletus-evolution from the primitive state with uncompressed spore.

SYSTEMATIC POSITION OF *AUSTROBOLETUS*

On turning to the recent contributions of other mycologists, I find that Romagnesi (1977) recognises but one family of Boletaceae with three genera, namely *Boletus, Gyroporus,* and *Strobilomyces;* other genera are regarded as subgenera of *Boletus.* This work is not cited by Wolfe who follows mainly the classification of Singer (1975). This author peremptorily dismisses *Austroboletus* as a synonym of *Porphyrellus* without the least consideration, omits the type-species *B. dictyotus* (Boedijn) Corner as well as *B. mucosus* Corner, neither of which fits his diagnoses, gives 19 species for *Porphyrellus* and lists 24, and refers *B. malaccensis* (Pat. et Baker) Corner, *B. rubiicolor* Corner and *B. rarus* Corner to sect. *Graciles* Singer subsect. *Subflavidini* Singer. Thus he writes that the development of the fruit-body in *Porphyrellus* is unknown, though I described and figured it for the type-species of *Austroboletus.* He puts the disputed *B. tristis* in sect. *Porphyrellus* without mention of *B. longipes,* and assigns it thereby to Strobilomycetaceae, whereas I put *B. longipes* in *Boletus* subgen. *Tylopilus* which, as a genus or subgenus, has always been assigned to Boletaceae; and there its sect. *Porphyrellus* is now placed. Thus, as I maintained in 1972, the two families cannot be distinguished. The attempt by Singer in his key (p. 166) leaves the position of *B. longipes* completely in doubt.

Horak (1976), in recording *Porphyrellus gracilis* (Peck) Singer from New Guinea, follows Singer but diverges in the foreword by dissociating subgen. *Austroboletus* from *Porphyrellus,* with the remark that it should be made a genus. He also dissociates *Heimiella* from *Boletellus,* with which I would agree, and I would add it as a fourth genus to Romagnesi's concept of Boletaceae.

CONCLUSION

This account reveals the shortcomings of relying solely on type-specimens when dealing with the fleshy basidiomycetes. It is generally acknowledged that the characters of their species and genera must relate to the features of the living fungi; it is the practice of specific or monographic works. The shortcoming is particularly troublesome with tropical species which have usually been described in the first place from inadequate field-notes. Such species need to be re-discovered and re-described from ampler and living material. So *B. tristis* is found to represent merely young fruit-bodies of *B. longipes*, even though the two species have been referred to different families. To understand the mature fruit-body, knowledge of its development is essential, and this can be obtained only by the collection of living primordia which must be identified. In tropical countries where the study of these basidiomycetes is still so much handicapped by these inadequate descriptions, the local mycologist must be helped with a classification as simple as possible. Reliance on electron-microscope introduces a method usually unavailable to the amateur, especially in the tropics, and frustrates that old-fashioned and direct means of identification with the light-microscope on which mycology has relied and will continue to need. I cannot see the use of *Austroboletus* as an SEM genus; indeed, there is insufficient knowledge to delimit it.

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